THE AUSTRALIAN EEB

→ Commonse Electronics

30c. PER COPY.

For Subscriptions, etc., see back page.

P. O. BOX 177
SANDY BAY,
TASMANIA 7005
AUSTRALIA

AN INFORMAL ELECTRONICS EXPERIMENTERS BULLETIN

APRIL 1972 vol. 8, no. 2 P. 25

SEX

NOW THAT WE HAVE YOUR FULL AND UNDIVIDED ATTENTION, WE SHOULD LIKE TO DRAW YOUR ATTENTION TO AN INTERESTING ANNOUNCEMENT ON PAGE THIRTY-THREE!

CONTENT:

P. 25: (All things come to he who mates...)
26: Receiver Design, V.
29: Counting with Electronics, I.
31: Threshold-operated Null-point Amplifier.
33: Editorial, Lit. Reviews, etc.
34: Advertising, if any.
35: Where the DX is at?
37: The Ordeal of Mail Order;
38: Finding Component Parts?
39: L: Available components.
Quotes, as relevant.
L: Up EEB! One of many letters
40: DANGER! Explosive Batteries.
41: L^2: 1972 ARRL Hbk Reviews....
42: Filter vs Phasing Exciters...
L: ARRL vs RSGB VHF Handbooks.
Q: Shielding in Commercial TXs
Responsibility in Science.
How to Kill Weeds...
43: L: Transceiver Decoupling
L: More abt Hot Carrier Diodes
44: Playboy Playmate, ugh.
A "Good" Beer Recipe from USA.

NEXT MONTH (June): A real beaut, with the remarkable new Reciprocating Detector, Light-beam communication, a New Look at FETs, more Rx design.

STATE OF THE RECEIVING ART, V -- RLG, +

-- Receivers in General, and Direct Conversion ones in Particular.... Continued directly from Part IV, December 1971.

NOTE-1: I regret that this series has to be chopped up this way, nor could it be completed this month, but receiver enthusiasts will appreciate that not everyone dotes on receiver design theory (at least not in large hunks).

NOTE-2: Drawings from previous sections of this series in 1971 are not reproduced here. Presumably if you are sufficiently interested you will consult the April and November versions for reference.

NOTE-3: The comprehensive Reference List for this subject is found on pages 132 - 134 of the December 1971 issue. It is for your convenience in pursuing further any special item which interests you, particularly for practical designs.

(But please do correct Reference 14d to read "4/72". Ham Radio did not publish that item in 1942!)

Front End Selectivity (concluded)

In reference to the argument about r.f. stages and the need for good r.f. selectivity in front of the mixer, I hope that my rhetoric did not cover the important point that even if you don't separate tuned circuits by a valve (etc), you can still obtain worthwhile selectivity by the use of one or more tuned circuits ahead of the mixer. In good sets this is done by doubly-tuned tanks at the front end (e.g. Ref 21b-3; 28, p. 88), and this is practical as long as the mixer has low noise.

Ref 14d manages to get amazing selectivity from a single tuned circuit by very low coupling to the antenna (thus requiring an extra 25db of low noise a.f. gain), and by the noteworthy use of an extremely high C/L ratio: 2 turns of wire and 13,500 pF on 80 Metres!

Good pre-mixer r.f. selectivity is essential to reduce adjacent-channel interference, and even reception of harmonic images (c.f. Nov, Dec EEBs). This is better achieved by good tuned circuits than by regeneration (or Q-multiplication) applied to indifferent ones*, because skirt-selectivity of the latter is worse (see EEB, Aug 1968). But commonse must prevail: r.f. selectivity will be better with regenerative feedback than without it. In direct-conversion receivers, an r.f. Q-multiplier can accomplish this flexibly (see refs 11b; 28; EEB, May and Aug 1968), though the feedback can presumably be applied within the mixer*.

MIXERS REVISITED: More uses of Linearity

I won't work this subject to death, but I have received an interesting note from Chris Pitcher pointing out how a 4-diode ring modulator (fig. 6) produces fewer spurious outputs than a 2-diode one (fig. 7); c.f. Ref 10. (p.28 for figs)

Very briefly the argument (from "Spectrum Analyser Circuits" by Tektronics) shows that the four-diode system halves the number of spurious products which appear in the output, and which must be rejected by subsequent selectivity filters -- particularly if those filters are not ideal.

The argument is also developed nicely by G8ENN in "A Mixer-VFO for 70MHz" in Rad. Comm of 3/72 (which came too late to include in the abovementioned Reference List), particularly with respect to mixing performance of FETs in balanced modulators (but note caution by G3VA in Ref 28, p. 83 and 88).

Now remember that mixers used as audio detectors are "Product Detectors" -- as are r.f. mixers! -- because the useful part of the output is taken from the mess of frequencies that result when the two signals are multiplied together (fig. 5, Nov; also in forthcoming RHF article). "A properly designed product detector should be capable of delivering an a.f. signal that is low in audio distortion and intermodulation products" (19b). And "The advantage of using a (more linear detector) is that it gets rid of the two original frequencies entirely, hence a quieter, more efficient mixer." (26h). That is why one prefers a more linear system like that of fig. 6.(p.28)

Linear mixing also increases the dynamic range, as mentioned in December.

Types of Mixers

Doubly balanced rings do make good mixers (particularly with Hot Carrier Diodes), but they need transformers, which can be a headache (26c), and which also have frequency limitations. (see p.43, this issue)→

Balanced modulators (viz, mixers) of the dual differential amplifier type are in fact simpler and less frequency critical. But they are less linear, and they have a smaller dynamic signal range.

---

* Ref 14d comments on the Ten-Tec RX10 D-C Rx: "(R.f. selectivity is provided by) the high Q of the input tank circuit. The high Q is developed by regeneration; when regeneration is removed selectivity will be about equal to that of a galena crystal set."!

Typical IC units are the Motorola MC1596G or RCA CA3028A; Refs 16a-h, 17a, 19b,24b. Typical dynamic range for the differential IC is some 90db, e.g. 3µV-100mV (16e) vs 130db for the well balanced HCD Ring e.g., 0.3µV-1V! (13h, 26c)

Therefore you choose the system to fit your requirements. There is no ideal semicon mixer, some are more ideal than others. But it is not necessary to use a semicon if you wish to be effective albeit out of fashion. "Some of the better solid-state receivers use a diode-bridge balanced modulator for their mixers. The input transformer for such a mixer is very critical, however, if the best results are to be realised, so the (amateur) who isn't too proud to use tubes will find the 7360 (beam-switching pentode) can't be outdone." (26h) (See also 24a,11b,26b)

Square Law Front Ends?

I leave this subejct gracefully with a whimsical piece which appears to hold promise for Communications Enthusiasts. It comes from A. R. Techniques ((III)), Ref. 28, p. 78:

Square-Law Resistors for Front-ends

The problems of developing hf receivers having front-end dynamic ranges of better than 100dB have been underlined many times. One of the very few semiconductor techniques capable of this type of performance is the parametric up-converter (*TT*, April 1968 or *Amateur Radio Techniques*, pages 66–68). But this technique, as Walter Schreuer pointed out, poses many problems for amateurs. Such a front-end requires large pump powers to reach acceptable linearity; furthermore they are not suitable for high-ratio down conversion.

Two recent articles by Dr J. G. Gardiner (*The Radio & Electronic Engineer*, May and June, 1969) have indicated that a new device, still under development, appears to offer considerable promise for high performance front-ends. This is the square law resistor or space-charge-limited diode of which some experimental prototypes have been developed by Dr G. T. Wright at the University of Birmingham. These diodes have an *I-V* characteristic following an extremely accurate square-law over a wide range of forward bias voltages. The importance of square-law characteristics for mixers are stressed in all articles concerning field effect devices. Dr Gardiner suggests that these SCL diodes could be used very effectively in balanced mixers to achieve very low cross-modulation and intermodulation; resulting in significantly better performance than can be achieved with ring switching diode mixers under identical operating conditions; furthermore only a few milliwatts of oscillator drive power would be necessary. High-performance receivers seem possible if these diodes can be fully developed.

Application to receiving Code

Most discussions in these days tend to be directed toward systems to receive radiotelephony. But in fact good mixer linearity is essential for good results with CW as well, particularly when selective audio filters are used.

For an interesting application of mixers to CW reception I recommend you to Ref 17a, and for communication effectiveness to Refs 17b and 17d. I'm not yet sure what to make of the place of the Reciprocating Detector (17c) in all of this, but we'll see more of that in June.

USE OF A.F. STAGES in Direct Conversion

Add a lot of a.f. to a frequency-synchronous detector (e.g. "product detector") and you have a Direct Conversion Receiver. See fig. 5 from Nov. 71. I will not reproduce figures forever!

Since virtually all the receiver gain must be obtained at audio this places a substantial burden on the noise factor of the audio system, and as Macario says this is more difficult at a.f. than at i.f. (34a-1).

Pickup of extraneous audio is also rather a problem (13e), though pick-up problems are not restricted to Direct-conversion. "Birdies" in good-old i.f. systems show that either design requires good geometry for a given degree of amplification: Murphy's Law.

Since virtually all of the Rx selectivity must also be obtained at audio, this also places a considerable burden on the audio filter, and it is a source of wonder that selectivity at a.f. is somehow regarded as less important than selectivity at i.f. or r.f.; more on that anon.

Among much else, the success of the Direct Conversion receiver may be assisted by the fact that an enterprising manufacturer has produced one for sale. It works on batteries, and from reports it performs reasonably well (14c,e). Skip Tenney says, "... in all cases performance was well above the simple tube-type superheterodynes which beginners have traditionally used". De Maw (19b) says that performance of a simple DC system is "as good or better than that of the popular Command series of receivers". That's nice. See also Ref. 32.

The Uses of Selectivity

The selectivity of the Ten-Tec Rx is governed by an audio filter with a 2kHz bandwidth (-6db), but from the "improvements" which have been suggested in the literature (14d,14e,etc) I deduce that the sharpness of the selectivity curve is not spectacular.

Selectivity sharpness is conveniently (?) measured by "Shape Factor": The bandwidth at -60db divided by the bandwidth at -6db; the better (i.e., closer to 1.00) it is, the better will be the rejection of QRM, for reasons self-evident in fig. 10: The dotted line represents an ideal shape (S. Factor 1.00).

Satisfactory selectivity is attained only with a good steep-sided bandpass response. The steep sides reject interference, and the flat top gives the best intelligibility for phone or CW (viz., reduces "ringing").

In Ref 28, Pat Hawker says, "The combination of a good product detector and a.f. filter cost less than a good crystal filter", but this applies more to CW (for which Direct Conversion systems have a distinct advantage for simplicity -- but then the old Regenerative Detector didn't do so badly either!).

For phone it is not quite so simple because of the need for a reasonable broad top with good shape factor. This is hardly achieved with the usual single section audio filter, and a 2-section (e.g. π) one still has a shape factor of some 2.5 to 6 or more (13e, 21c, 29c). Doubtless a suitable response can be achieved by active or passive filters*, but there has been remarkably little comment on the shape of such filters except for the very sharp requirements of CW.

The Attainment of Good Shape Factors

In 1971, Ed Noll (16d) said: "Presently the audio filters used in direct conversion receivers are relatively simple types. The inclusion of audio filters with a better shape factor is just a matter of time". Why?? Why has it taken so long? There exists no lack of of information about such filter designs in the periodical or other literature. Why haven't they been incorporated into DCs?

In April 1969, Pat Hawker (Tech. Top.) was suggesting that high gain low noise good bandpass a.f. amplification could be provided by cascaded tuned a.f. stages rather than " a block filter plus wideband a.f. amplifier". A permutation of this theme was shown recently by ZS6BT in Ham Radio (17b) where substantial improvement in S/N ratio was obtained when bandwidth was limited sequentially (in steps) throughout a (superhet) receiver.

Note the connection.

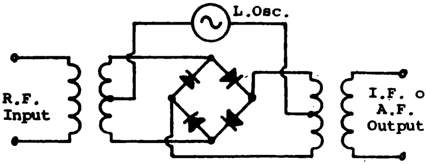


Fig. 6: Doubly-balanced mixer -- or "Product Detector" when output is at a.f. (c.f. 26a). Hot-carrier diodes work best (12,13). See also p. 43, this EEB for balancing....

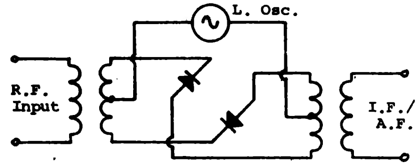


Fig. 7: 2-diode balanced mixer. Not as good.

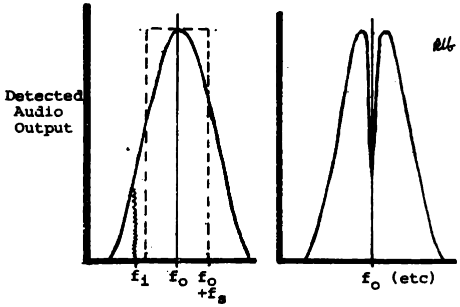


FIG 10: Left = RECEIVER RESPONSE USING AN ORDINARY LOW-PASS AUDIO FILTER. f_o = freq. of carrier (e.g. the suppressed one), $f_o + f_s$ = maximum (upper) sideband to be received (say, 2500 cps higher than f_o), f_i = interfering signal. The solid line shows essentially the receiver selectivity characteristic, as goverened by a simple audio filter. The dotted line shows a filter response with "ideal shape factor"; see text.

Right = RECEIVER RESPONSE USING A BANDPASS AUDIO FILTER. This is the more likely good design, with a low-frequency cutoff at, say 300 cps, which puts the big dip in the middle of the curve. The principles are essentially the same as for left-hand figure.

((CONTINUED, P. 30)) >>>>>>>>>>>

---

* 10c, 13e, 16d, 21cd, 24b, 28, 29abc.

COUNTING WITH ELECTRONICS, Part I

-- by R. S. Maddever (VK3)

Herein is described a single counting stage, for which the parts would cost about $1.80. Such stages can be coupled to others to form a binary counting unit.

These units work in exactly the same way as sections of any large modern digital computer. They will not, however, count as quickly as modern computer circuits, some of which can handle many millions of counts per second. The unit described here will only work if the pulses occur less rapidly than about 50,000 per second -- quite fast enough for most applications.

Operation

The circuit is normally known as a "flip-flop" because, like a coin being tossed, when it comes to rest it has to be in one "state" or the other, i.e., with one side up or the other side up, but not together. In this case, one state is ON, the other is OFF.

The circuit consists of two simpler circuits, each having one transistor, called NOR gates, which are connected so that the output of each gate (viz., transistor stage) is connected to the input of the other.

In this way, in the diagram, when transistor Q_1 is ON it keeps Q_2 OFF. If you introduce a signal pulse which turns Q_2 ON, even for a brief instant, it immediately turns Q_1 OFF, and this transistor then holds Q_2 in the ON state... To understand this fully from the circuit diagram it helps to follow the sequence of currents and voltages which result when each transistor has applied to its base a "turn on" voltage.

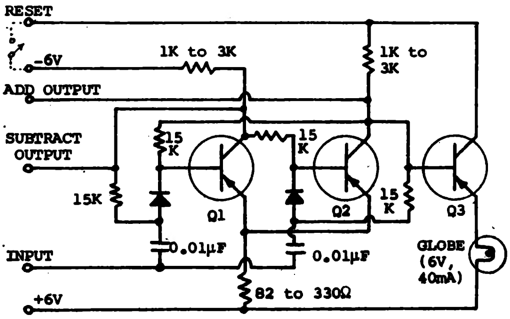
In order to be able to tell which side of the flip-flop is ON, a lamp is attached to one side through a third transistor, Q_3. Q_3 acts as a switch for the lamp, and reduces the load on the flip-flop transistors. The lamp could be connected in the collector load of one of the flip-flop transistors, but in that case the two gates would be unbalanced, circuit operation would be less reliable, and the components more critical. The globe used should be a low current one for the transistors suggested, e.g. to operate with only 40 mA.

The Circuit Diagram

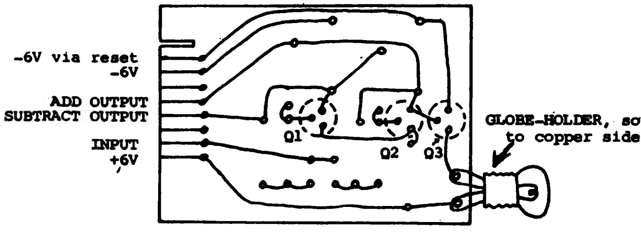
Q_1 and Q_2 form the flip-flop. Notice how the collector of Q_1 is connected to the base of Q2 through a 15 KΩ resistor, and the collector of Q2 is connected similarly to the base of Q_1.

The input pulse is sent through the two capacitors to both transistor bases (or "inputs") through the diodes, and to both collectors through further 15 KΩ resistors. The diodes enable the input pulse to get to and operate only the transistor which is ON, turning that one into the OFF state. The next pulse which arrives then operates the other transistor, turning it into the OFF state, so that matters are back to where they started when two pulses have been introduced.

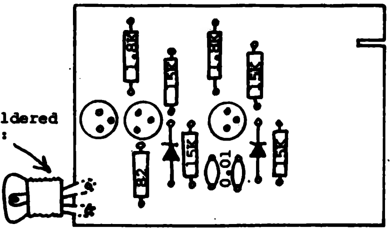
The diodes, capacitors and attached



THE FLIP-FLOP COUNTER. Transistors are the computer-board types 015, 034 or equivalent.



PRINTED CIRCUIT BOARD, half size (Viewed from copper side)



PRINTED CIRCUIT BOARD, half size (Viewed from the other side)

15 KΩ resistors are therefore, called the "steering circuit".

Adding or subtracting is carried out by connecting the following stage from one or the other side of the flip-flop, but more of that in Part II. (August)

Transistors used came from disposals computer boards, but nearly any small PNP transistors could be used.

The Printed Circuit Board

This is shown from both sides. The board is shaped with a slot so that it will fit into a special 8-way edge connector. If such a connector is not available (although it can be made up easily enough), wires can be connected to the holes on the left-hand side of the board.

If on the other hand, you do want to be able to plug the unit into a socket (facilitating multiple stage use), it is important to get the end strip connections just right.

The best way to do this, is to put the board into an 8-way socket a few times until you can just see where the socket has scratched fine lines on the board. The "resist" is then painted in strips to go accurately over these fine scratches, yet not to touch each other.

The two soldering lugs on the globe holder should be swivelled round so that they are close to each other, but not touching, and then bent down and soldered so that the globe holder fits where shown.

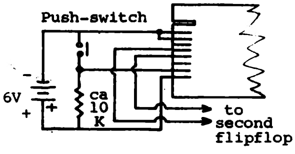
The input circuit

The input circuit shown is simply a test one to show the operation of the circuit, for interest. Any pulse source could be used, having sufficient power to drive this unit.

References

Some useful references are:

"Computer Circuit Projects you can build", by Boschen.
"Computers Self Taught through Experiments", by Brayton.
"ABCs of Computers" by Lytel
"Electronic Computers made Simple", by Basford.



A SIMPLE INPUT CIRCUIT (Each time the switch is pushed, the lamp should change state) (to be continued...)

STATE OF THE ART (Continued from p. 28)

Now, if these ideas are combined with the design of good square-top filters, to what heights might not Direct Conversion devices soar...?

But look: It should be evident now that the technology for providing a good shape of response allowing both good intelligibility and selectivity is not appreciably easier at a.f. than at i.f. And for the latter, mechanical or crystal lattices have been developed which can do wonders. Even I remember cascaded i.f. stagger-tuned tanks which were quite effective in the olden days -- and compared to 16 pole crystal lattices they were cheap, cheap.

I.f. stages also allow easier AGC and when properly proportioned they take care of "audio image" (to be discussed). For the same trouble, then, why not have the selectivity at i.f.? -- where lots of low noise gain can be produced, and with minimal problems of hum pickup.

Shape Factors and The Amateur's Dilemma

I am not making a molehill mountain. This matter of the design of the Filter in a DC or superhet is a fine illustration of the abiding problem overtaking the harried Amateur.

Consider the following: ↗p.28

The dotted line of fig. 10 represents the use of a selectivity filter with ideal shape (S.Factor = 1.00); the need for a good shape is self-explanatory in fig. 10, if you wish to obliterate the interfering signal, f_i.

A good shape is hardly approximated by the single section L-C filters often used (or by double ones used only to achieve broad bandpass), let alone R-C ones whose shape factor is conservatively, bloody awful.

By the use of several well designed L-C sections, a reasonably good shape (sharp or wide bandpass) can be obtained by active or passive circuits (see previous references).

Now, Dick Ferris has calculated that a simple 3-section low pass filter (with constant-k and m-derived sections) can be designed with a shape factor ofapproximately 1.2. Compare this with a shape factor of 2.5 for a 2-section π low-pass filter (13e), 2.5 for a good commercial L-C device (29b, 16th Ed.), 2.3 for a good mechanical filter (29a) or 8-crystal lattice (29b, 17th Ed, not 18th), 1.9 for a typical 9 Mc crystal lattice (Swan advert), or 1.28 for Swan's fancy ($100) 16 pole crystal lattice filter!

(CONT.: P. 32)>>>

THRESHOLD-OPERATED NULL-POINT AMPLIFIER

-- L. J. Yelland (VK3)

Last month EEB described a sensitive null-detector to indicate visually the approach to the null point of bridge operation. But it is also possible to use that null to operate other equipment automatically when the null is reached, e.g. through the action of a solenoid or relay. An obvious application of this is in sensitive automatic temperature control of a system, sensed by a bridge incorporating a thermistor.

With the usual type of amplifier so designed, trouble is often enountered by partial operation as the input approaches zero. This means that chattering can occur with a signal that is nearly zero, and becomes particularly troublesome when it is desired to allow some tolerance above actual zero -- or when extreme accuracy is necessary, viz, when operating very close to zero.

An Improved Amplifier System

In the circuit shown in the diagram, both inverse and reactive feedbacks are employed to make for maximum operation at exact zero, or at some set point adjacent to zero. It also discriminates against any attempt at operation at another point very close to this theshold value.

The high gain input amplifier (SE4001) is biased to near cut-off by the potentiometer setting. Its output is direct-coubled to a switching transistor (2N3646) and this, in turn is couple to another switch (2N3567).

Operation

Any voltage which is applied to the input terminals, raises the SE4001 base above cut-off, so that it conducts. The 39K resistance in its collector circuit drops the voltage at the base of the 2N3646 to below its cut-off value, so that it does not conduct. Consequently, no current is available for the base of the 2N3567, and it does not conduct either.

That is the quiescent condition, when the bridge or other device connected to the input is not at zero.

When the input becomes zero, the SE4001 will be cut-off. The base of the 2N3646 is now connected to HT through the 39K resistance, and current flows in its base. Current now flows in its collector circuit and via its emitter into the base of the 2N3567, which also now conducts to operate a solenoid or relay, etc.

The current of the 2N3646, which is the base current of the 2N3567, is derived, initially, from the 250 µF condenser on the HT, but after this is discharged, it comes from the Main HT thru dropping resistance (R).

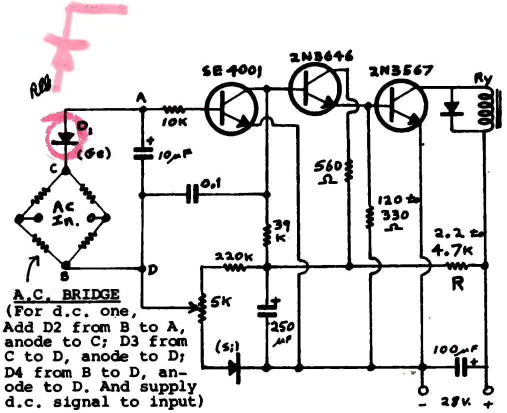
This reduces the available HT to abt one-third of its commencing value, with a corresponding drop in solenoid current. Its actual value will depend upon the function to be performed by solenoid or relay. If just one sudden impulse of solenoid plunger is required, then (R) may be high enough to drop the current to a very low value. Or, if a relay is required to remain closed, (R) should be adjusted to give that lowered value of current which will maintain the relay in closed position, after it has been operated by the first impulse.

Adjustment

In the active state, the pot is adjusted so that the voltage at its moving arm, plus any desired vestige of voltage across the input, just reduces base voltage of the SE4001 to point of cut-off. This is very critical and may be regarded as the crest of the "hill" of its base voltage curve, so that any slight increase will tip it over the "hill".

To maintain this critical voltage against variations of mains voltage etc, a silicon diode is included in the bias network, functioning as a forward Zener, and keeping the low end of the pot at 0.5 volt. This adjustment of the potentiometer is made with the other two transistor collectors disconnected, and a voltmeter on the SE4001 collector to indicate cut-off.

Normally, in the quiescent state, voltage will be available at the input to cause conduction by the SE4001 and the other two cut-off



A.C. BRIDGE
(For d.c. one,
Add D2 from B to A,
anode to C; D3 from
C to D, anode to D;
D4 from B to D, anode to D. And supply
d.c. signal to input)

THRESHOLD-OPERATED NULL-POINT AMPLIFIER

Operation near Zero

Now suppose that the input voltage is reduced almost to zero. The SE4001 is not quite cut-in but a little current flows in its collector, reducing base voltage of the 2N3646 near to its cut-off, but so that a little current flows in its collector. This is insufficient to cut-in the 2N3567, but flows mainly thru the resistance across the base/emitter. This raises the emitter voltage of the 2N3646, and as its base is connected to negative by the slight conduction through the SE4001, inverse feedback occurs to prevent any build up. Thus the 2N3567 is not cut-in, and the solenoid is not operated.

But suppose that the input voltage is slightly lower than this. That would take the SE4001 more nearly completely over the "hill" and reduce its collector current to a value which enabled the 2N3646 base to be nearly right over its "hill". Sufficient current would now flow in the 2N3646 collector circuit, to cause a slight reduction in HT due to dropping resistance (R).

Such a drop in HT is reflected at the arm of the pot, where a much lower reduction takes place, but sufficient to make the SE4001 more nearly cut off. Thus a reactive feedback occurs, with current building up the the 2N3646 circuit until the 2N3567 is cut-in. Thereafter, considerable voltage drop takes place, the SE4001 becomes completely cut-off, and current rises to maximum in the solenoid until condenser is discharged.

The overall result is that operation either takes place or it doesn't. There is no partial operation, and the point at which operation will take place can be adjusted by the setting of the potentiometer.

xxxxxxxxxxxxxxxxxxxx

For the guidance of readers who may wish to make substitutions, the characterestics of the transistors used are as follows (From the Fairchild Cat.):

SE4001: NPN Audio Amp, 25V, 60-300β, $I_{cbo} < 200nA$ at 5V, f_T 60 MHz. $V_{ce(SAT)} = 0.35$ at 1mA and β of 10.

2N3646: NPN High Speed Switch, 15V at 10mA (LV_{ceo} roughly analogous to BV_{ceo}), 30-120β, $I_{cbo} < 500nA$ at 20V, f_T 350MHz. $V_{ce(SAT)} = 0.2$ at 30mA, 10β.

2N3567: NPN GP Amp/Switch, 40β, 40LV_{ceo}, $I_{cbo} < 50nA$ at 40V, f_T 60MHz, $V_{ce(SAT)} = 0.25$ at 150mA, 10β

NOTE: "β" above is h_{FE} (d.c. current gain), not dI_c/dI_b; the latter can be found in the mfr's specs curves as a function of I_c. Fairchild are quite satisfactory as a source of technical information on such matters: Fairchild Aust P/L, 420 Mt. Dandenong Rd, Croydon Victoria 3146. (In Auckland: John Gilbert and Co'P.L, phone 30839).

xxxxxxxxxxxxxxxxxxxxxxxz

STATE OF THE ART (Continued from p. 30)

Why don't we find good designs applied in the amateur literature?* The average engineer would regard the design of the abovementioned simple filters as an elementary exercise. Yet the average Ham appears to regard such as great obstacle.

Dick Ferris says: "This would appear to be the old question of what the amateur wants. He wants to build first class gear but without the need to become an engineer or to read technical books. Unfortunately with the advance of technology these points are now irreconcilable."

Ignoring Blakeslee's opinion (EEB, last month, p. 19) that the average Ham has scant need for radio engineering, the Amateur who does want to design good filters for Direct Conversion (or anything else) will find readable though superficial descriptions about them in the RSGB and Orr Radio Handbooks; a terse description also appears in the ARRL effort. If he finds that he needs a better background to understand such devices (particularly in predicting their performance) he'll have to consult an engineering textbook. If this requires the use of algebra and trigonometry, they will have to be used -- and this can be satisfying indeed. Nothing beats the thrill of designing your own gear, and having it work first go (well, perhaps second go)! ((CONT. IN JUNE, sri))

---

*Qualification: Fine designs for filters do appear, e.g. in 10c and 21c, with summaries in 29abc, but who uses them? Thus, most current DC designs use one section L-C filters for the broadband steep-skirt requirements of modern radiotelephony, or gawdelpus, R-C. Some go as far as two sections, but a good example of this problem is illustrated by Ref. 29c (the 1971 ARRL Hbk) where a DC Rx uses a primitive doubly tuned L-C tank audio filter. Yet a very nice 5-pole Chebishev thing (using 3-1/2 std. 88mH chokes) appears a few pages earlier in "an Audio Filter for Phone and CW". This is rather the kind of selectivity needed by a modern amateur receiver. Why this kind of inconsistency?

"... but Testes are not responsible for producing mature male characteristics, therefore they should be eliminated." !
(Answer on a Matriculation Biology examination paper)

SEX: IMPORTANT ANNOUNCEMENT

On brooding over the hillarious machinations of the "constipated bureaucracy" in banning various books and Hindu-type mystics, it came suddenly to me that therein lies the answer to the EEB circulation problem: SEX.

I'd like to reach the 1000-subscriber level or more, just for my great ego, since I've about given-up on attracting a torrent of commercial advertising — and oh its nice to publish stuff without fear of offending advertisers! But in spite of magnificent publicity efforts by our Promotion Manager (me), we continue to lose subscribers who can't take RLG in doses, or who prefer communications from Communications Magazines (e.g. AR, B-I, QST, Rad. Comm, etc.), or who are interested primarily in electronics and fie on all that philosophy stuff and reviews of literature people will never read and discussions of new components people will never use —— etc.

Well, all right, but NOW you can tell your friends that EEB features SEX, and on the front cover too (but not in colour — costs too much). Since this pleasant activity is regarded with dismay by Elder Statesmen (who, one presumes, have no children), it is certain to draw their wrath. With luck EEB might even be banned, and we could set up with a hot duplicator in Rod's basement. This would surely do wonders for our circulation, and we could charge $1.75 p.a....

If, therefore, readers have any electronics applications related to SEX they are invited to contribute; we'll read them carefully. Heh. But they'll have to be a lot better than the stuff on p. 44 here.

In the meantime, in the abovementioned magazines (and the rest) you'll find plenty of transmitters and receivers & other useful items. Contribute your useless items (but interesting) to EEB — and ask your friends to subscribe...?

To assist you in this endeavour, we are willing — for a limited time — to offer you a free year's sub or renewal on present sub if you send us new subscriptions for two other people; if you prefer you could have about 20 transistors worth of computer boards (while they last) instead of sub — or any reasonable permutation or combination, etc.

(The only reason I'm willing to entertain such a programme is that promotion costs fiendishly much, and with a 10% or so yield on advertising, each new subscriber costs a fortune. Might as well let you have it as the big mags, PMG, etc)

GUEST EDITORIAL: By Chris Pitcher (on North Island)

Re your September and October 1971 efforts, I very much think you are fighting a losing battle against the Post Office. The basic tenet of Government in this country is rule by the majority. Put another way, the minority (the pensioners, people who read books, etc) have no rights and therefore can be exploited (I thought I heard someone mention National Service — must have been the wind!). Approximate percentages for direct and indirect taxation in this country a few years back were: DIRECT = 14%, INDIRECT = 36%. You really think the Government will let the PMG show a profit? Ha. Anyhow, must go now and post this; hope it gets to you. ((It did, 10 days later — Ed.))((from Melbourne))

ILLUSIONS REVISITED — back now to RLG: Reference Editorial, Dec 1971, p. 125, "Illusions and Commonse".

"AUTOMATIC MORSE CODE Copying Machine. Featured in Ham Radio Magazine November 1971. Copy up to 120 wpm without knowing Morse Code. Simply hook to your receiver audio and read printout. Send $14.95 for detailed construction plans....." — an Advert in the April 28th (1972) issue of "Ham Ads", an interesting new advertisement medium, issued every other week from P.O. Box 46-653, Los Angeles, California 90046, U.S.A., and "for a limited time we are offering a special introductory subscription rate: A years subscription, plus a free 75 word ad costs only $4.00"; available to subscribers is a special 10c/word advertising rate, too. Could be interesting for American gear or components.... Incidentally, the title of this section referred obviously only to the Quote. "Ham Ads" sounds like a good idea.

STOP PRESS: FOR SALE, Radio Transceiver, Heathkit SSB200, P/S, Spkr, Exciter 10 to 80Metres, Linear 1kW, 20M antenna, PTT mic, $650 ono. W. Coertse, 22 Treeby St., Coolbellup, W.A. 6163.

ADVERTISING

EEB still QRV, HR subs, $A8.50/3-yrs!

This Page: Personal = FREE   Commercial = 20 c/line or 80c per SIX LINES.   We guarantee nothing..................

FOR SALE: High quality Automatic Coil Winding Machines: See December 1971 EEB for details. A beaut opportunity.

= =

COMPUTER BOARDS FOR SALE: If anyone doesn't already know, these are assemblies out of obsolete computers. They use good germanium transistors with gains of some 30-100, voltages to match, frequency of operation up to BC (f_T typ 5Mc). The boards cost 10c per transistor (postpaid), and the diodes, resistors, condensers etc are free. We got these originally as a scheme to promote EEB, but response was not as favourable as anticipated. It seems that people are now willing to pay the 50c or 70c needed to get a good silicon transistor for their construction projects. But in fact these 10c germanium transistors are quite satisfactory for all noncritical, audio, power, etc, applications where high temperature independence or high frequency capability is not essential.

The Computer Board Notes are a compendium of unseful information about the boards: 20c extra. WRITE EEB at S. Bay.

= =

HOT CARRIER DIODES: HP5082/2800 are again available (Ref EEB Nov 1971, p. 103ff), as advertised here in September, but this time they only cost you 1.00 each, postpaid — but add 6c if payment by cheque, and 15c if you want the post to be Certified (i.e., if you want to be assured of delivery by our efficient PMG). This is less than you would get them from overseas, not to mention Customs!. Characteristics of these are even better than those mentioned in the November editorial: 70 volts breakdown "allows high voltages in sampling gates, and wide dynamic range capability" as mixers and detectors of all kinds. The diodes have "the high breakdown and temperature characteristics of silicon, the turn-on voltage of germanium, and the speed of a Schottky barrier, majority carrier device." With a 250 Megohm reverse resistance at -50V, and a phenomenal front/back ratio, these diodes can also find wide use in any application requiring high impedance characteristics. And their frequency response is astronomical. They are very good for linear operation in any mixer, balanced mixers being better, and doubly balanced ones being best — as discussed in this EEB.

Interestingly, even better are the HP5082/2835 Low Offset Schottky Diodes, with an even sharper switching characteristic, lower forward offset, therefore even more linear. BUT its PIV is only 5V, and in fact one would normally operate it well below that. Since, however, the voltage drop forward will also be less (so requiring less forward bias), considerably less driving voltage will be necessary, thus promoting linearity, lower noise, and reduction of crossmodulation in subsequent stages. The main amplification in such a system occurs after, not before the mixer.

On the other hand, you can only obtain advantage from the 2835 diodes if you know what you are doing. The average bloke will be better off with the 2800, which can also be used to good advantage as high impedance signal diode in place of OA90, or high voltage point-contact silicon in place of OA200 etc. And the HCD is cheaper!

Experimenters seriously interested in signal processing should request the relevant Application Notes from H-P: HP5082/2800, HP5082/2835, Appl. Note 907 (The Hot Carrier Diode; theory, design, and application), Appl. Note 923 (Hot Carrier Diode Video Detectors). HP5082/3080, Appl. Note 922 (Applications of PIN Diodes — TR switches and the rest!).

These can be obtained (only) by request on Company Letterhead from: Hewlett-Packard Australia P/L, 22-26 Weir St., Glen Iris, Vic. 3146. BUT ORDER YOUR DIODES FROM US; H-P won't be bothered with orders for 4-off quantities, etc. ((Incidentally, we are making zero profit from this; just a public service to promote State of the Art)) — EEB.

= =

PRINTED CIRCUIT BOARD MATERIAL: 1/16" G-10 Epoxy Board 2 ounce copper. Factory New:
3x3" = 45c; 3x6" = 85c; 6x9" = 2.75; 12x12" 6.00; P.C. Board Etching Solution, $1.25/pint.

TRANSISTOR SOCKETS FOR (round) TO-5 sockets. Standard 3-pin TO-5 type, or 5-pin universal to fit TO-5, MOSFETS, etc; 10c each, your choice ((I have found these extremely useful in construction and experimentation — RLG)).

ALSO: A wide range of 400mW and 1W zeners at 25c, rectifier diodes at low prices, 80mH toroids at 10/$2 , and much more. Send stamp for Catalogue: M. Weinschenker, K3DPJ, Box 353, Irwin, Pa. 15642, U.S.A.

((Ed. Note: Prices are in $US, but you can send him the same numerical amount in $A, and we'll buy them from him; do not cross out the "or bearer" on your cheques, but do cross them "Not Negotiable". Consult Customs before ordering...))

EDITORIAL (continued from p. 33):

Second Quote from Amateur Radio, May 1972, p. 13: "The unit I propose to describe ((fully)) has the following features:-

1) Fully solid state.
2) Use of ICs for simplicity.
3) Capable of having a full QSO without touching the key. ((EEB emphasis))
4) Capable of changing the programme at will.
5) Repeat and re-cycle operations.
6) Reset to start and reset at any stage." etc.

from "Programmable Digital Keyer" by D. A. McArthur, VK8KK. Most impressive.

In the April 1972 QST a bloke has made much the same point as I mentioned in December, and in the overseas article if it gets published, except that he made it with humour — and that's probably better!

This & That

Last month's EEB was modestly late, but an extra 3 weeks was added to it by the fact that our good printer is becoming shockingly successful owing to his good work and relatively low prices. So I reckon you will be reading this sometime in late June, but never mind. June may actually be published in July since I have typed out most of it already. Having a Secretary helps enormously; now if only I could teach her how to type rapidly I could give her EEB and go fishing!

If you're going to make a photocopy of the P.C. board fig. 3 from Maddever's article in the February issue, I suggest you fill-in the black a bit. The new paper we are using for offset does not take the ink too well in the larger areas, though I must say it looks lovely in all the rest. I suppose we'll have to solve the problem for the front cover of each issue by making up a metal plate (at expense) and doing a year's worth in colour.

WHERE THE DX IS AT! — by Greg Johnston, VK7KJ

These notes will be rather disorganised, owing to the fact that I am leaving tomorrow on the voyage described in the February EEB! I should get back to VK7 about the first week in July. In interim will be QRV 20Mx from about May 1st/MM around 14198 or 14225 when time permits on the way to Auckland and then on to the Kermadecs, Minerva Reef and Tonga (FB place I gather!) — movements from time of arrival there are uncertain. The following are from DX-press, with equivalent items in the Geoff Watts News sheets*(7KJ comments)

TONGA: VR5FX using his new PX and worked in UK 14035 CW 0818Z. QSL via ZL2AFZ. *NB: Also on SSB 14110 abt 0700.

GLORIEUSES ISL.: FR7AM/G often reported in low SSB part on 14Mc, also high end 21Mc. *Hrd here quite regularly arnd 1500Z just below 14200; the big pileups are the clue.

SSB DX: ((NB: Some additions, below, by RLG, current-26/5))

Sierra Leone: 9L1MF 14192. *Band es QRM bad.

CW DX: //WILLIS ISLAND: SOON TO BE ACTIVATED

Monaco: 3A0GA 14027// French Somaliland: FL8DA 21055

Jordan: JY6FC 14010. *OK but QRM fantastic!
JY6FC 14011. " " " " //JY9GR, Amman QRV

Alaska: KL7MF 14035.// North Pole:UW3HY/0 14016

VQ8AD: 14028.// Serrana Bank: KS4BA. *OK if u don't sleep!

Crete: SV1FD 14019// Canary Is.: EA8BK 21045

Gabon: TR8CQ 28024. *OK but band U.S. mostly.

Finland: OH1JN/OHo 14006. *FB.//Tchad Rep: TT8AC 14265-300 0430-530Z.

ED NOTE: There are a pile of DX-presses here, and another lot of Watts News sheets are accumulating at Greg's place, but I can't make any sense of this DX stuff; enough for me to figure out what all those countries are. Is there any avid DXer out there who would like to receive the stack, and give us an idea which few items are of particular interest to Australasia, with perhaps his own comments? We need such for our June issue, because 7KJ will be off then on his own private DX-pedition! Ah, sigh....

The March 1972 73 has a constant-current battery charger for Ni-Cd cells; reference p. 40 this EEB. Its simply a lamp in series with the half-wave diode, with a resistor across the lamp selected to draw 25-30% of the current drawn by the lamp. The idea is that Ni-Cds should be charged for 15-16 hrs at 10% of their milliampere-hour rating (but does that assume complete discharge?), and you can not conveniently calculate that with the usual fairly constant-voltage output of an ordinary pwr supply. Personally I'd find it easier and cheaper to use a computer transistor instead of the lamp and resistor. Transistors are (PTO) inherently constant current devices y'know.

Heavens! I just realised that the title of the abovementioned article is "Constant-Currant Charger..."; maybe my wife would be interested in it too for the kitchen?

Last September we ran a piece on the American phone band expansion. Since then the news has only been good. The Chief of the "Amateur & Citizens Division" of the FCC (Amateurs are not citizens??) said (as reported in World-Radio, 7 Feb 72): "if we have any sense, or concern for the future of Amateur Radio it would be utter folly to irritate those whose votes we need during international negotiations". In consequence of which they are not going to expand 20, 15, or 10 Metres, hooray!!

The event, or rather non-event has outraged a goodly section of amateur opinion in America, well represented by W5EYB, in Collector & Emitter of March 1972:

"Most certainly I share Mr. Walker's view that we must consider the opinions of other countries. But by the same token, I feel other countries should consider the plight of this country's 265,000 amateurs. On this point I fear the Commission, and possibly the League, have been unduly influenced by the aggressive lobbying of our Canadian neighbors."

Just to keep this matter balanced, lets close with a quotation from a Letter to the Editor in CQ, April 1972:

"... Well, as in all other conferences, decisions are not made at the conference table. Subjects are discussed and decisions are made in the hotel lounges or bars, and as none of the U.S. official deligates usually speak any languages other than English, surprises, generally unpleasant, come at the official meetings. See for instance, 40M and broadcasting." !

Ummm, shall we send from Australia some deligates who have a command of other languages, ummmm?

Only trouble is that that letter-writer's conclusion is that the answer is to dump restrictive licensing and open up all of all the bands to phone thereby, presumably filling every nook and cranny with Yankee twang at 1kW or more. Seems a stiff price to pay, but there you are.

Calculating Torroid Inductances (I mean: Toroid)

I was wrong (EEB Dec 1971, p. 122). The relevant formula for the inductance of a cranky toroid would be $L = KN^2$ — and not $L = N^{2K}$. The right formula makes it even easier, and no need to use the value of K given in the article in Ham Radio of Feb 1972, since that applies only to a commercial component available in America. For the locally-available material you can use high-power [illegible], as my simple suggestion of winding some turns, finding L, and solving forK, to allow extrapolation to new N from new L. Or ask Aust Mfr for value of K.

COMPONENTS AVAILABILITY

My spies tell me that there may be more to the situation than my simplistic view of supply in Australia, but I simply presented it the way I saw it. There are several degrees of complexity possible, depending whether you are a one-off experimenter, or an enterprising manufacturer...

We'll be following up the subject with some pregnant quotations next month, and eventually we'll present a list of selected transistors available from firms who have bothered to reply to us AND to furnish prices. This whole subject of component availability can be ambiguous. It can depend on how close you live to the main cities, and how willing you are to go to a bit of trouble investigating mail order supply, junk sales & auctions, etc....

I might note that in reference to the problem of Australians obtaining merchandise overseas, I have been making some enquiries, and it seems that there are several firms willing to deal with us. For example World Radio Corp, although they have a $100 (one hundred dollars) minimum order requirement. Barry Electronics Export Corp in N.Y. and Meshna in Mass. seem to be quite available, without obvious minima. There are several small suppliers of semiconductors noteworthy amongst which is Babylon Electronic Equipment Co, P.O. Box J, Carmichael, California 95608, U.S.A. On the other hand, we never did get a reply to several enquiries sent to Hal Electronics who have advertised willingness to sell to DX; perhaps the letters got lost.

BUT we have succeeded in finding a personal Representative who can obtain components — as available on the American market by one who knows where to make contacts — or commercial transceivers, instruments, etc. Markup over the American retail price is likely to be some 5% to 10%, depending on total value and how much trouble is involved, etc. Considering the 15% difference between $A and $US, and the substantial markup by middlemen here, that would result in the saving of quite a lot of money to you. I must stress that components availability here can be quite good compared to that in the U.S.A. or even U.K., ~~but you~~ would likely save more on large bits, even after Customs.

On the other hand, for esoteric components which have not come here yet, or for which Yankee Reps in Australia are awkward, or for surplus stuff available uniquely in the USA, our Rep could help you. Keep it in mind... See also the adverts for British merchandise in Rad Comm and W. World. — The British are outstandingly honest, reliable & cooperative.

EEB
P.37
4/72

THE ORDEAL OF MAIL ORDER

BY D. J. HOLFORD*

HOME brew is a wonderful idea, for the ham near a large electronics store. But how about the man out in the sticks? He must rely on mail order for his parts, and that can be an adventure akin to tracking tigers. You never know what will happen next.

My introduction to the perils of mail order came several years ago when I moved away from the stores. I needed parts for a construction project, and blissfully ordered them from a large mail order house which promises shipment within twenty four hours.

Some six weeks later a few items arrived, including a number of substitutions, (I am surprised they didn't send one six meg resistor instead of the dozen half ones I ordered). The rest of the order was "back ordered", a new term to me then but one I have since become intimately acquainted with.

The rest of the order arrived within the next few weeks and consisted of a large collection of small components tossed into a chassis, and wrapped in brown paper. Needless to say confusion reigned supreme. The small parts were mangled and bent and some were missing having escaped through the gaping holes in the packing. The interior of the chassis was a sight to see. Among the shipment were a few tools which had made some beautiful dents (if you like dents) in the chassis.

In addition to all this, there was no invoice and since the shipment had come from New York it had to pass Canadian Customs. If you have a free day sometime, try to convince a skeptical customs officer that you are telling the truth about the values of unmarked parts. Eventually all the parts were obtained and the project completed.

Not having learned my lesson I decided to try again. This time I ordered in addition to some components, a set of pliers and a wireless intercom. The intercom and some parts arrived over a three month period. The pliers were back ordered (I now knew what it meant). When the pliers arrived some time later they were accompanied by a customs declaration form, unfortunately it listed the value of the full order. If you think I had fun the first time, you should have seen me trying to convince the customs officer that the pliers were not really worth fifty dollars. I think he was beginning to wonder about me.

I stayed away from mail order for over a year. But then the intercom needed a special part. There was no other choice, so I ordered it. After numerous back orders and queries a part finally arrived, it was the wrong part! I returned it and received a back order and a photocopy of my order. Eventually the right part arrived, over a year after my original order. Incidentally this particular house is big on photocopies. They answer queries by photocopying everything you sent them and stapling it to your letter. We ended up shipping a half inch of paper back and forth to each other. I don't think they own a typewriter, they must have spent their entire budget on photocopying machines. After pleading with them to write to me I came to the conclusion that they own a computer, the copying machines and a monkey to work them.

Being a glutton for punishment I entered the arena again a couple of years later when I needed a special item I could not find anywhere else. Off went my order accompanied by a prayer or two. Back came another back order slip advising shipment in a few weeks. A few months later I received a form letter apologising for not sending me the bill earlier. I replied that I was still awaiting delivery of the item. Silence for almost a year, when I received a bill for one cabinet. I wrote a letter

[*Continued on page* 40]→ EEB

---

*RR 1, Enfield, Hants County, Nova Scotia, Canada.

← Reprinted from (with thanks)

FINDING COMPONENT PARTS? --RLG

The preceeding reproduction of the article from CQ started us thinking about the situation in Australasia. From correspondence and from several American magazines it is evident that the few experimenters who survive in the U.S.A. are encountering considerable difficulty in obtaining electronic components.

It appears that their parts market is facing primarily the needs of industrial and military consumers. Even if the trend to build had not diminished, the vast increase of the other services would still dwarf it in that Technocracy.

The American Literature does, from time to time, display articles and letters by amateurs who have rediscovered the experimental approach, although there is still a deplorable tendency to depend on published circuits for even the simplest functions, rather than applying basic and reliable principles of design.... But all the technological expertise in the world won't help much if you can't buy the parts with which to build.

And in Australasia, what?

Here we are perhaps more fortunate. On one hand the local parts availability can be terrible if one lives outside of the largest metropolitan centres. As a matter of course experimenters have developed their own methods for obtaining (or even making) parts, methods which are only now, it seems, being discovered overseas: canibalising old radios or TV sets, disposals equipment, ordering by post, or as a last resort -- improvise it yourself.

We have another considerable advantage: we do not depend so much on commercial specifications. If a diagram calls for a 2N174, say, we are not above using a 2N1100 if at hand, or perhaps even an OC26 or 2N301 or AD 149 or whatever, depending on the actual power (or voltage, etc) requirements of the circuit.

Or, if we have a similar NPN unit (e.g. 2N3055), and if it will handle the actual current (etc) we are not unwilling to change polarities, and perhaps add a bit of r.f. bypass if silicon.

Or, if a diagram calls for a 0.01 µF Ducon, we are not above substituting a 0.01µF Jap if we have it, or even 0.02 µF. Of course this requires the commonsense of knowing whether the higher quality of the Ducon is required (as for lower leakage, etc), or whether the capacitance is critical (as for determination of frequency).

It seems to be rather a problem in America that if a diagram calls for a 0.01µF Part No. 123X, you are in trouble if you have only 0.01µF part No. 123Y. If indeed one considers the monumental amount of radio parts and equipment available on the surplus market over there (courtesy of the latest War), and advertised copiously, it is difficult to interpret the widespread quandry over availability of small parts.

In Australia and New Zealand, electronic component prices are (now) often quite reasonable, and we also have a large body of suppliers who advertise in national radio magazines (but alas not much in EEB), and this is particularly important because of the abovementioned difficulties which can be encountered with local parts availability. You are able to order material by post, and allowing for the usual Australian lethargy you can have them delivered anywhere, in due course. I am not, of course, considering the implications of the increasingly usurious postal rates, nor indeed the fact that commercial people have been finding it more reliable (and even cheaper) to send equipment by private carriers...

We have a sufficient number of mail-order houses that we are able to shop about and find which have the best prices. Beware!, such establishments no longer (necessarily) sell at "Wholesale" levels... In this regard it can also be valuable to see whether items can be obtained directly from the Manufacturers if same maintain retail or semi-retail outlets; we have often found their prices to be substantially below those of certain other firms. Needless to say we can't mention any names, nor will we supply them by post; you'll just have to use your ingenuity and commonsense -- and pool your knowledge informally in your radio club meetings.

We also have a number of disposals (surplus) equipment houses which advertise regularly. Although (in contrast to some experience with the U.S.A.) they tend to be honest, you do take your chances -- but an interesting (and profitable) adventure it can be, if you are willing to test everything you receive. Although I didn't have very good luck with a CRO so obtained, I have been able to get a fine assortment of components.

But remember the cautions expressed in our Avalanche Diode article last February, that the purchase of a new component may well be preferable if you need the reliability or ratings of commercial items.

Finally, don't overlook the Classified columns in all the mags (including EEB); why pay more if you can pay less?

Keep our standards of commonsense and improvisation high, keep experimenting, maintain an Amateur Certificate of PROFICIENCY rather than a "Licence", support the mail-order suppliers. Then we'll never (or hardly ever) need to arrive at the technological impotence experienced Elsewhere.

<><><><><><><><><>

LETTER: A Diffemnt View of Availability?

Some months ago I sent over to the Sylvania Co. (in U.S.A.) for two copies of the Technical Data Manual (14th Ed); it contains a lot of information on radio tubes and a conversion list with thousands of transistor conversions to the Sylvania "ECG" range of transistors. The Manuals were priced at $1.90 each and I allowed 50 cents per copy for postage by surface mail. Twelve days later the books arrived in the letter box at home. They had been sent air mail from the States at a cost of $6.60. A couple of days later I received a letter in the mail from them saying that the books had been sent out free of charge to me and they returned my bank draft for $US4.80.

At the same time I ordered a neon lamp from a mob in (N.S.W.)... The lamp arrived in the mail yesterday. They probably had reasons for taking so long with supplying the lamp, but it is no wonder why the Yanks do well in business, hi.

-- L. L. Sharp, Chermside, Qld.

((Some American firms use Air Mail liberally, but you certainly can't depend on it, and don't request it unless you are willing to pay for it. I have even requested from a firm that merchandise be sent by sea, and it was sent by air -- with a postage bill! It is true that some Australian firms are slow to fill orders, but that is a price for the casual Australian Way.. Surely we wouldn't want it to become as frantic as U.S.?-- Ed.))

Quotes without Comment

"One old timer was telling me how they constructed transmitting crystals out of spectacle lenses of the quartz variety. It makes one realise how fortunate we are with modern components being available."

-- ZL4TAA, Spectrum (NZ), 8/69.

"... (Big U.S. Radio Supply Houses) cater to the dabbler in novelty projects -- after you write off the 95% devoted to "music" and CB. And where does that leave the amateur of radio? Out in the cold! Do we really deserve this fate? Have we actually stopped buying? Did the buying stop before the source dried up??"

-- W5JJ, Collector and Emitter, 12/70.

"Even in the U.K. and U.S.A. home brewers are finding it hard to get the right ingredients. Presumably economic necessity is forcing retailers to discontinue items for which there is limited demand, which means high handling and postage charges on a one-off basis. Kit set providers seem to have the items, proving that they are still manufactured. Another nail in the coffin of the complete Amateur? Or would the formation of co-operatives to buy in bulk be a solution?"

-- ZL1HV, Break-In (NZ), 9/71.

"... $15,000 - $20,000 GETS YOU IN BUSINESS FOR YOURSELF... Joint Allied Radio Shack in a rare opportunity to capitalize on the zooming demand for everything in consumer electronics. We have over 950 stores nationwide but must expand to meet the growing market ($10 billion in 1971 alone!) and need energetic men and women to operate new or existing stores...."

-- ((From an Advertisement in QST, 1971))

"It is important that the workshop denizen realize the flexibility that exists when substituting for a given component found in the parts list of an article. Unless the constructor is attempting to make a 'carbon copy' of what he sees in the book or magazine, he need not use identical parts... ((examples)). Don't be afraid to make substitutions. After all, the (amateur) operator has long been known as an inveterate experimenter, and that's really the basis of the game... ((Follows various descriptions of opportunities available from the Surplus market, old sets for parts, importing, electrical supply and hardware stores etc...))"

-- W1CER, QST, 10/70, "The Ham Builders Nightmare".

xxxxxxxxxxxxxxxxxxxxxxxx

LETTER

I have meant to renew my Sub several times but kept putting it off, so this time I'm going to make sure of it.. I have over the past two years cancelled my subscription to two or three other magazines, and the only one that I have missed has been EEB...

Trusting that you and the other members of staff of EEB are able to continue publishing Australia's most informative Electronics publication, for many years to come,

-- Gordon Sutherland, VK2ZSG/T, Newcastle

DANGER! Explosive Batteries! ((RLG))

In the March 1972 issue of The Radio Bulletin*, R. Callander points out that rechargeable Nickel-Cadmium cells can, under certain conditions, explode with considerable force while being recharged. This is obviously important for all people in electronics

Full details are in the interesting original article and should be consulted by anyone contemplating the use of Ni-Cd batteries. But tersely, it is important to avoid complete discharge of the Ni-Cd battery, and to use a large enough cell rating to handle a given load so that cell discharge is not too rapid.

"It is better to recharge the battery more frequently for shorter periods of time than it is to allow it to become discharged completely and then to have to charge it for several hours. Shallow discharges will result in a much greater number of cycles over the useful life of the battery..."

Strictly speaking these cautions apply stringently only to the small "button" cells, and not, say, to the larger "Size D" types used for electric torches etc, because the latter cells incorporate a pressure-relief valve. But in our opinion the shallow-discharge cycle is a very wise precaution in any event, because on one hand the valve might be faulty (what is perfect?), and on the other the battery may incorporate the button-type cells in a deceptively larger case.

Nothing is simple.

THE EASTERN AND MOUNTAIN DISTRICT RADIO CLUB

-- with a note on Radio Teletype.

*The Radio Bulletin is the official publication of the Eastern and Mountain District Radio Club serving the Mitcham and Mooroolbank region of Victoria. From evidence of the publication it must surely be the most active radio club in Australia -- else it has the most dedicated Editor!

The Bulletin has some 30 to 50 duplicated quarto pages per issue, and is issued monthly or so. Here are some of the articles which have appeared in it since October 1971, beginning with the most recent (April 1972):

Novices, pro. The G5RV Antenna in 80 feet.
Slow-scan TV News and Developments, standards.
Transistor Parameters, explained thoroughly.
Speech Amp/Control for FM Base Station system.
Simple TV Camera using slide projector backwards!
The Moibus Loop, full details, including its use
 on a Tape Recorder to double loop length!

A very thorough examination of Novice Licensing.
Recharging Nickel-Cadmium Cells.
Crystal set design (RLG!)
Viten MTR-13 "Carphone" circuits/ 2M conversion.
Diode circuits; 33 of them over several months.

Wadley Loop Receiver availability
JLF Crystal oscillator

LM373 IC Multi-mode detector
Salvaging Saltwater-damaged radios
Design of regulated P/S (better than ours)
Outboard IF filters for valve receivers
Telegraph distortion in RTTY circuits
Simple transistor tester. Choosing replacement pots

Video Signals and Distortion
Clipper Amp; 160M Tx; Vinten BTR10 Base circuit
National Parks in Victoria (lovely)
Epoxy; changing car earthing; audio preamp.
Basic Radio Teletype: a clear and thorough introduction to RTTY, several installments, beginning in the October issue.

We had hoped to reprint this fine presentation of RTTY in EEB, but on one hand we won't have enough room for a while, and on the other Frank Merritt, VE7AFJ has promised us a good series of articles on the subject. He has just sent us a long outline of the items planned, and it ought to be nice. In interim we recommend you to the Radio Bulletin one.

Personally, I have an open mind on the value of radioteletype; it can't be any more inane or mechanical than many present voice QSO's and it is certainly unambiguous -- if receiver conditions are reasonable. Sensitivity can be quite amazing; see Kelly's article in the Dec 71 EEB.

I have heard quite a lot of rubbish on the air, but many good and lucid articles produced when electronics people sit down to a typewriter; perhaps the slower speed engages more of the brain before putting thought into deed? The same applies in large measure to code (CW) communication as well, though with significant and subtle differences -- e.g., involving the SKILL of copy -- at least in the days before automatic morse translators...?

There is, therefore, a good argument in favour of RTTY, and the abovementioned set of articles describes the technical background fundamentals; other publications also cover it well, e.g. the RTTY Handbooks by CQ or 73, and of course coverage by the regular Radio Amateur Handbooks.

Membership in the EM/DRC not only brings the abovementioned Bulletin, but also the availability of components and equipment at favourable prices, as well as various technical books and booklets.

For people fortunate enough to live in Eastern victoria, membership also brings the opportunity to attend meetings for good fellowship, family outings, barbecues, conventions, field days, technical lectures, and sales and auctions. Whether or not you live in Victoria I suggest that you write to the Club for a Membership Application Form and enclose, say, 25c in stamps for a sample copy of THE RADIO BULLETIN, to:

-- The Secretary, E/MDRC, P.O. Box 87, Mitcham
 Victoria 3132.

The cost of membership is $3 per year ($1 for Juniors), and includes the magazine (not available separately). There is a once-only joining-fee of 50c (25c for Juniors), in addition to the first Membership Fee.

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

THE ORDEAL OF MAIL ORDER

(Continued from P. 37)

the order I still have no cabinet. Mind you I get photostats once in a while. I am still talking to the photocopier with no hope of finding humanity. All this despite repeated pleas for a letter, or some other indication that there are still people in New York.

I should make it clear that I am not tarring all mail order houses with the same brush. Some of the smaller ones provide excellent service. But if you want unusual items the big ones are the only place to go, even if it does take a year or two. ■

LETTER: The 1972 Radio Amateur's Handbook (Published by ARRL, Newington, Connecticut, U.S.A.)

The '72 Handbook has been completely reorganized with the view of putting the sections on receivers, transmitters and modes (cw, ssb, fm, RTTY, SSTV, am, etc.) together in proper order. A full new chapter has been devoted to frequency modulation and repeaters, while the coverage of SSTV, ATV and space communications has been expanded. A number of chapters have been rewritten to include data on the newer transistors and all types of integrated circuits. And, a bevy of new construction projects has been added.

The chapters that have received the most attention are:

1 -- Amateur Radio: Update regulations and charts.

2 -- Electrical Laws and Circuits: Actual oscillograph photographs of modulation, heterodyning and beats added.

4 -- Semiconductor Devices: Eight new pages added to describe complex linear integrated circuits and the digital logic families.

5 -- Power Supplies: Text updated and rearranged, plus a new IC bench supply has been added in the construction section.

6 -- HF Transmitting: Complete rewrite of theory section to include power transistors, ICs, broadband circuits, PLLs, electronic dials, premixing, and network design. New construction projects include a 10-watt, 1-tube Novice transmitter, a 6-band cw transmitter, an 800-W sweep-tube linear amplifier, a 1-kW single-tube amplifier, and a 30-W transistor broadband amplifier.

7 -- VHF and UHF Transmitting: Rewrite of the theory section to discuss ssb operation, the use of transverters and vhf TVI problems. New projects are a 6-meter transverter, a 2-meter transverter, and a 500-W 432-MHz amplifier.

8 -- Receiving Systems: Major rewrite of the theory section for coverage of transistors and ICs, mixer and spurious-signal problems, plus i.f. noise blankers. A bc trap, an FET preselector, an IC active filter, an hf receiving converter, and a tunable receiving converter head the list of new construction projects.

9 -- VHF and UHF Receiving Techniques: Discussion of transistor selection for use in vhf receivers and a new 432-MHz receiving converter have been added.

10 -- Mobile and Portable/Emergency Equipment: Changes in this chapter include the addition of a new mobile power supply for ssb transceivers, a Transmatch for portable use, a 2-meter fm receiver, a 2-meter fm transmitter, and a 25-watt-output amplifier for 2-meter mobile use.

11 -- Code Transmission: Rearranged theory section, rewritten to provide additional information on break-in systems and cw keying. A keyer, relay driver and t-r switch are the new construction pr.

12 -- Amplitude Modulation: The theory section has been recast to show the use of solid-state devices. New spectrum-analysis photographs have been added, along with a hand-portable 2-meter transceiver and two solid-state modulator designs.

13 -- SSB Transmission: The theory section has been rewritten to include new filter designs, use of ICs, speech amplifier circuits, speech processing, and driver circuits. Construction projects include a transverter for 1.8, 21 or 28 MHz and a 20-meter transmitter.

14 -- FM and Repeaters: This is a new 28-page chapter covering all aspects of fm and repeaters, including seven construction projects (in addition to the 2-meter fm gear described in Ch. 10).

15 -- Specialized Communications Systems: Expanded chapter to cover ATV, SSTV, space communications, FAX, and phone patching, in addition to RTTY. An RTTY afsk generator and an SSTV receiving adaptor head the list of construction proj.

16 -- Interference with Other Services: Includes a new section on prevention of problems with rf getting into hi-fi sets.

17 -- Test Equipment and Measurements: Contains data on the new WWV format, and an outstanding new impedance bridge is described in the construction projects section.

20 -- Transmission Lines: Revised data on Transmatches has been added, including a description of an "Ultimate" built for this book and a 160-meter version.

21 -- HF Antennas: Expanded to include new data on Yagis, limited-space antennas, triband quads, a loaded quad for 40 meters, a 10/15-meter duobander, and a simple homemade tower.

22 -- VHF and UHF Antennas: Completely rewritten to be easier to understand and use.

-- D. A. Blakeslee, W1KLK, Newington,
Connecticut, U.S.A.

((Reference W1KLK's Letter in the Feb. 72 EEB))

* * *

LETTER: The New ARRL Radio Handbook

I just got a copy of the 1972 ARRL Handbook this morning, and inside it has a few new projects, many old. An updated antenna chapter has been simplified considerably, with many detail drawings on how to put insulators on dipoles, build baluns and other beginners stuff.

In fact, in looking over the new edition, I get the distinct impression that they're shooting for the beginner and novice much more than the advanced operator. I don't know if that's a step forward or backward!

ARRL does now include a balanced beam-deflection mixer (p. 238), but they still don't appear to have a Vackar or Seiler oscillator, although those items have appeared widely in the periodical literature for some time, and in the RSGB Handbook and in Amateur Radio Techniques.

Finally, I notice that they no longer neutralize the Dual Gate MOSFET r.f. stage about which you people have been complaining for some time (e.g. Dec 71), but neutralization is still used in one of their VHF circuits. Perhaps they are trying to take care of indifferent construction technique possible with the fellows who build their stuff.

-- U. S. Kallam, Cardiac, New Jersey, USA

((EEB readers will recognise the renowned name of Kallam. It means "pen" in Arabic, or so I am told by one of our staunch authors who prefers to be known as "I. N. Kallam" ("INK" -- pen, see?). He seems to have relatives overseas, in this case a very real correspondent somewhere in the Eastern U.S.A. Hi. -- Ed.))

((See also: "Filter vs Phasing Exciters", on P. 42 , this issue))

FILTER VS PHASING EXCITERS:

Some Quotations from the ARRL Radio Handbook.

1) 1971 Edition, p. 251:

"Generally the filter-type exciter is easier to adjust than the phasing exciter. Most home-built SSB equipment uses commercially made filters these days. The alignment is done at the factory, thus relieving the amateur of the sometimes tedious task of adjusting the filter for suitable bandpass characteristics. Filter type exciters are more popular than phasing units and offer better carrier suppression and alignment stability..."

2) 1968 Edition, p. 254:

"Properly adjusted, either system ((phasing or filter)) is capable of good results. Arguments in favor of the filter system ((are)) that it is somewhat easier to adjust without an oscilloscope, since it requires only a receiver and a VTVM for alignment, and it is more likely to remain in adjustment over a long period of time.

"The chief argument against it, from the amateur viewpoint, is that it requires quite a few stages and at least one frequency conversion after modulation. The phasing system requires fewer stages and can be designed to require no frequency conversion, but its alignment and adjustment are often considered to be a little 'trickier' than that of the filter system.

"This probably stems from lack of familiarity with the system rather than any actual difficulty, and now that commercial pre-adjusted audio-phasing networks are available, most of the alignment difficulty has been eliminated. In most cases the phasing system will cost less to apply to an existing transmitter..."

((Or to a receiver. See the "Two-Phase" System" section of our State of the Art article in June issue. The possession of some kind of oscilloscope is, of course, a reasonable assumption for Australasian amateurs and other builders of equipment. -- RLG))

xxxxxxxxxxxxxxxxxxxxxxxxxx

LETTER: A VHF Handbook Comparison

Recently I have had occasion to sit down for a good look through the RSGB VHF Manual as well as ARRL's VHF Handbook. I think that the best example of the difference in technique comes with the uses to which they put 4CX250 tubes.

RSGB use one, with the comment that two can be used, but it gets cumbersome, and besides who needs that power anyway. ARRL use three of the beasts on 60MHz, and complain that they can only get two to work on 144MHz.

And when it comes to construction, e.g. ARRL:"Use EIMAC Finger Stock, Part No.--- for connections". RSGB: "Take a strip of flashing copper, size ---, and cut slits with a fine saw..." etc. And of course RSGB usually have more than one alternative. Perhaps Americans hate indecision?

--- C. Pitcher, Northcote, Victoria

((Pitcher and Reynolds are preparing a proper technical Review of these two books, to appear soon in EEB. -- Ed.))

xxxxxxxxxxxxxxxxxxxxxxxxxxx

Quote

"... Very few, if any, commercially built transmitters have adequate shielding to prevent harmonic radiation, particularly when the transmitter is operated in a fringe, or weak-TV-signal area. Most manufacturers put a metal enclosure around the final amplifier circuitry, but that isn't enough. Meter holes, inadequate filtering of leads entering and leaving the transmitter, open spaces on the cabinet, and lack of clean metal-to-metal bonding are all possibilities for the escape of harmonic energy. Even though a low-pass filter is installed, harmonics can reach the antenna to be radiated and cause interference."

-- L. G. Mc Coy, W1ICP, QST, 3/72.

xxxxxxxxxxxxxxxxxxxxxx

How to Kill Weeds

A sure cure is to place the offending morsels in a large pot, fill with boiling water and cook firmly for 15 minutes. The resultant soup is full of vitamins and minerals, and makes good "plant food" to use in the garden; with the flowers will come weeds which....

A caution: If you are tempted to sip the soup "just to see", make sure first it doesn't contain any hemlock or foxglove -- which grow abundantly in Australia as weeds!

xxxxxxxxxxxxxxxxxxxxxxx

Quote

"It seems clear that, in considering a possible revision of its program and policy, the AAAS cannot responsibly, at this time, continue to say simply that it seeks to serve science.

"I think it must broaden and deepen that purpose, and affirm that it seeks to assist in the development of procedures whose basic purpose is to assure that the awesome power of science be brought to serve the cause of a humane rationality, emphasizing the importance of human, of natural, of spiritual values, difficult indeed to subject to analysis, but all of which must be given due consideration if we are to develop and preserve a culture worthy of our potentialities.

"Scientists can no longer hide behind the untenable pretense that they have no concern with values. Judgments on priorities must be made.

"I do not think that these judgments can be safely left to a few highly placed individuals..."

--- "Science in a Troubled Culture: A prescription", by Warren Weaver (past President, American Association for the Advancement of Science) AAAS Bulletin, February 1972.

LETTER: A Need for Transceiver Decoupling

Here is a problem which may interest you. When the Collins 75S3 receiver is tied to the 32S3 exciter for transceive operation, the exciter sometimes "sucks out" the signal from the heterodyne crystal oscillator of the receiver. This calls for a method for unloading the receiver oscillator, perhaps by some kind of emitter follower that will handle a couple of volts and pass it on to the exciter via the coax. This would allow sufficient drive to the exciter, without reducing the injection of the heterodyne crystal oscillator into the receiver.

Some ZL's have verified this on their equipment, and found that the 21 Mc and 28 Mc bands "came to life" when the heterodyne crystal oscillator coax (which looked like 19Ω at 19 Mc) was shortened to 16 inches, or even better the exciter's own crystals are used not in transceive. These require slight retrimming of the oscillator alignment.

What we need therefore, is a coupling device with Z_{in} of a few hundred ohms or more, to take a couple of volts to a 50Ω coax up to about 35 Mc. No gain needed. Perhaps one of those broadband r.f. amplifiers with FET input and emitter follower second stage would do it if the FET were not overdriven.

This is a world-wide problem that very few have recognized in Collins S-Line equipment. A nice little design jobbie for some chap in your area.

-- E. H. Conklin, K6KA, La Canada, Calif.

((What's wrong with a very ordinary transistor emitter follower using a bipolar with an f_T of a few hundred MHz, e.g. a 2N3642 or TT3642? A Z_{in} of a few hundred ohms ought not to be difficult to obtain at 35 Mc.--Ed))

((Fine, but my catalogs don't list 2N3642 or the TT3642. -- EHC))

((Those are Fairchild types in this country, but in any event any lower power transistor having suitable frequency response would suffice. There is no need to be a slave to transistor type numbers... To assist the experimenter in such matters, the big transistor companies periodically publish lists of "preferred transistors", at least in this country and in Europe. We shall be publishing a summary of them at the conclusion of the "Components Availability" series, in a few months. -- RLG))

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Every year it takes less time to fly around the world and more time to drive to work.... Recently, a ten year old wrote, on the Birth of Babies, a composition that went like this: "In France baby girls are found in roses and baby boys are found in cabbages. In England and America babies are brought be the stork. In all other countries, babies are born in the normal way." (W8QUR, ARNS Bull, 8/70)

xxxxxxxxxxxxxxxxxxxxxx

LETTER: More about Hot Carrier Diodes

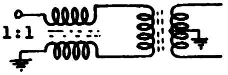
In reference to your Editorial in the Nov 1971 EEB on Hot Carrier Diodes, I would bring to your attention an article in QST, March 1970, "An Engineers Ham-Band Receiver" by DL6WD. It is a rather exotic piece of equipment, in fact complex. However, the Front End is relevant to your series.

That receiver uses two 3N128s in cascode, 4 hot carrier diodes in a ring arrangement, and manual attenuator on the r.f. stage. Points made were the "utmost importance of proper impedance matching in the mixer", measured conversion loss of 8db, receiver dynamic range of 80db, sensitivity on all bands better than 0.1 µV for a 10db S+N to N ratio for a 30% modulated a.m. signal.

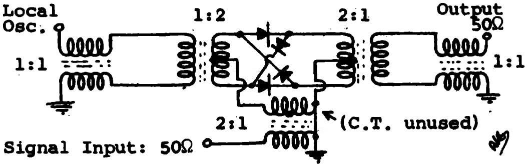
Another interesting reference comes from 73 Magazine, March 1969, "A Better Balanced Modulator" by WA1FRJ. The author claims that the "standard" ring demodulator using trifilar wound input and output transformers suffers limitations:

> "Due to the single-ended input, one side of the secondary has more capacitance to ground than the other. This unbalanced capacitance has increasing effects as the operating frequency increases..."

The easiest way to neutralise the effect of this unbalanced capacitance is to isolate the return side of the primary from ground:



He ends up by writing "The addition of a third trifilar transformer makes a well balanced mixer over the range 2-30Mc -- dynamic range 130db! with hot carrier diodes." Thus:



Unfortunately I don't have access to Ham Radio march 1970. Maybe W. Ress said all this and more...

-- Ken A. Harding, Sydney, N.S.W.

((No, Ress didn't show just that. He presents a converter circuit without the bottom xfr, though he does use input and output xrs which would be balanced if earthing were removed, but it is rather difficult to tell about this, because he injects signal and oscillator in different places than above. He says, "The gain compression point... is 1 volt rms."; if sensitivity were 1µV that would give a dynamic range of 120db, or 140db for 0.1µV. Performance in this respect is probably similar to that of the 73 article, but the latter would be expected to give better isolation between the two signals, therefore particularly relevant to sideband suppression as balanced modulator... We are grateful to OM Harding; this is the most useful kind of letter. -- Ed.))

xxxxxxxxxxxxxxxx

METRICATION is coming to Australia, and we shall be replacing the convenient unit of the inch (which could have been decimalised) with the centimetre (which doesn't fit in at all well with the length of one's knuckles). In keeping with our Theme this month we present the following to assist your endeavours in appreciating metrication, reprinted (if Chris's presses will take the burden) from an ordinarily staid (199% ARRL) electronics pamphlet:

Playboy Playmate is Texas-born Carol Willis, with vital metric dimensions as follows: 1.65 meter; weight (mass) 50.39 kg; 91-63-91 cm. All our readers know that this is the modern way to express 5'5", 111 lbs. 36" - 25" - 36".

EDITOR
Carl C. Drumeller, W5JJ

GOOD (sic) AMERICAN BEER

-- Ed Aoki (Sunnyvale, California)

EEB has boasted several reportedly-good beer recipies -- which must be diluted as needed to satisfy the queer laws of your land. Here is a good Yankee brew, which need not be diluted (at least not here):

Boil 9 gals water for 10 minutes.

Pour 1 gal hot water into crock.

Add 4 lbs corn sugar + 1 can malt.

Stir well until all sugar and malt is dissolved.

Cool remaining 8 gals of water to lukewarm temperature.

Add 8 gals of water to crock, and stir.

Allow to ferment in cool place for a week to until not more than 1% of sugar left. When using a beer hydrometer, 1% = 1°B.

Put 1 tsp corn sugar in each quart bottle (designed to withstand at least 5 atm pressure, or a regular beer bottle of 1 qt cap)

Siphon ferment into bottle.

Cap bottle.

Brew ready in a week or longer.

Note: It is best to grow up a pilot batch first and use a tablesppoon or two of the bottom yeast to innoculate the main batch later. If the yeast is to be stored, keep moist and in refrigerator.

((Good Lord, no Hops!!! Now we know why Yankee beer tastes as it does. -- Staff.))

THE AUSTRALIAN EEB: Editor = R. Leo Gunther (VK7RG), Asst. Ed. and most draughting = Rod A. J. Reynolds (VK7ZAR), Assoc. Ed. = Chris Pitcher (Northcote, Vic), Associates: L. J. Yelland (Prahran), R. S. Maddever (Geelong); Subscription Manager = Robert A. Walton, Secretary = Brenda Ford.

SUBSCRIPTIONS: $A1.55/yr, $A4.20/3-yrs; $US2.50/yr, Stg. 1.05/yr; Foreign: 10% discount for 3 years.
BACK ISSUES: 30c each, post free, 1972 only.
BOUND VOLUMES: 1970 or 1971 = $A2.55, $US3.50, etc. -- includes necessary exorbitant Certification for Australia, or necessary exorbitant Registration for Elsewhere. We pay dearly for our inefficient Post Office.

NEW ZEALAND: Subscription rates same as Australia, but remit through N.Z.A.R.T., P. O. Box 1459, Christchurch. Bound Volumes $NZ3.00 each, postpaid. We'd prefer that $3.00 in Australian money, but if you can't get any, request through NZART, and they'll take a bit .

THE REST OF THE WORLD (including Australia): Send all orders to: R. A. Walton, 115 Wilmot St., Huonville, Tasmania 7109, Australia. If you need an urgent reply send your enquiry to Sandy Bay address (see cover).

SUBSCRIPTIONS begin only with the next regular issue; all others must be ordered separately as back issues. EEB is usually late and it also takes a while to process Back Orders, so please be patient.

RENEWALS: Please send your renewal promptly when you receive your Notice, but not before. If you don't send your address label with your renewal we'll probably end up sending you two copies and then we'll go bankrupt so if you want to keep receiving EEB send that address label (or at least tell us you're renewing!).

PLEASE PLEASE PRINT YOUR NAME AND ADDRESS CLEARLY IN ANY CORRESPONDENCE TO US. Pretty please? Thank you.

THIS ELECTRONICS EXPERIMENTERS BULLETIN IS PRINTED EVERY OTHER MONTH or so, BEGINNING FEBRUARY or March. PROSPECTIVE AUTHORS SHOULD SEND FOR OUR "MANUSCRIPT POLICY" SHEET. ARTICLES EARN FREE SUBSCRIPTION CREDIT (ONLY). IF YOU HAVE A TECHNICAL FACT OR OPINION, HERE IS YOUR OPPORTUNITY TO SHARE IT WITH OTHERS.

Printed by Advance Publicity Co — Hobart — 341-817